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ENTRANCE EXAMINATION FOR ADMISSION, MAY 2010.

Ph.D. (COMPUTER SCIENCE AND ENGINEERING)

COURSE CODE : 106

Register Number :

*Signature of the Invigilator
(with date)*

COURSE CODE : 106

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (D) or (E) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

2010

1. Fuzzball is a
 - (A) Mainframe computer
 - (B) Mini computer
 - (C) Micro computer
 - (D) All of the above
 - (E) None of the above
2. Which one of the following is a first public data network?
 - (A) X.25
 - (B) Frame Relay
 - (C) ATM
 - (D) All of the above
 - (E) None of the above
3. In the circular array version of the Queue class, which operations require constant time for their worst-case behavior?
 - (A) GetFront
 - (B) Insert when the capacity has not yet been reached
 - (C) IsEmpty
 - (D) All of these operations require constant time
 - (E) None of the above
4. In some programming languages, an identifier is permitted to be a letter followed by any number of letters or digits. If L and D denote the sets of letters and digits respectively, which of the following expressions defines an identifier?
 - (A) $(LUD)^+$
 - (B) $L(LUD)^*$
 - (C) $L.D^*$
 - (D) All of the above
 - (E) None of the above
5. Which of the following is essential for converting an infix expression to the postfix form efficiently
 - (A) An operand Queue
 - (B) An operand stack
 - (C) An operand stack and an operator stack
 - (D) An operator stack
 - (E) None of the above

6. Define a context free language $L \subseteq \{0,1\}^*$ such that $\text{init}(L) = \{u/uv \in L \text{ for some } v \in \{0,1\}^*\}$. Let L be the set of all binary strings w such that w is non empty and has an equal number of 0's and 1's
- (A) The set of all binary strings with unequal number of 0's and 1's
 - (B) The set of all binary strings including the null string
 - (C) The set of all binary strings with exactly one more 0's than the number of 1's or the more 1 than the number of 0's
 - (D) All of the above
 - (E) None of the above
7. Data origin authentication or message authentication techniques provide assurance
- (A) Of the identity of the party which originated the message.
 - (B) Of the validity of the data
 - (C) Of data integrity
 - (D) All of the above
 - (E) None of the above
8. In a real computer, what will happen if you make a recursive call without making the problem smaller?
- (A) The program keeps running until you press Ctrl-C
 - (B) The results are non-deterministic.
 - (C) The run-time stack eventually overflows, halting the program.
 - (D) All of the above
 - (E) None of the above
9. What is the granularity of buffering in file-level caching?
- (A) A disk block
 - (B) Several disk blocks
 - (C) A file
 - (D) All of the above
 - (E) None of the above

10. Direct memory access is
- (A) Used to increase a systems performance
 - (B) More secure than indirect I/O
 - (C) Used only in devices that performs direct I/O
 - (D) All of the above
 - (E) None of the above
11. What is the purpose of the Device Status Table for interrupt-driven I/O?
- (A) To mark the status of each device at boot time.
 - (B) To save the status of a pending I/O operation.
 - (C) To make the current status of each device available to the entire kernel.
 - (D) All of the above
 - (E) None of the above.
12. The Fountain model differs from the Waterfall model in that
- (A) The various phases of the development process happen in the reverse order in the two models
 - (B) The Fountain model allows for the development process to "fall back" to earlier phases when necessary
 - (C) The Fountain model always splits the development effort at each stage: some effort moves on to the next phase, some is directed back to review of earlier stages
 - (D) All of the above
 - (E) None of the above
13. Which one of the following activities is not an objective of phase 4 of the SDLC, systems development?
- (A) Acquire hardware
 - (B) Test the system
 - (C) Address the make-or-buy decision
 - (D) All of the above
 - (E) None of the above

14. An interrupt is the same as a trap in that they both
- (A) Block the process currently using the CPU
 - (B) Cause the processor to switch to supervisor mode and branch to a handler
 - (C) Indicate the completion of an I/O operation
 - (D) All of the above
 - (E) None of the above
15. _____ allows the programmer to ignore portions of the search tree that make no difference to the final choice.
- (A) Pruning
 - (B) Game tree
 - (C) The minimax algorithm
 - (D) Cutting off search
 - (E) None of the above
16. The set of entailed sentences that *increase* as information is added to the knowledge base is called
- (A) Resolution
 - (B) Monotonicity
 - (C) Nonmonotonicity
 - (D) Inference
 - (E) None of the above
17. _____ specifies a mapping from symbols to the model.
- (A) Constant symbols
 - (B) Predicate Symbols
 - (C) Perception
 - (D) Interpretation
 - (E) None of the above
18. The State-space search which operates in the forward direction is called
- (A) Mutex
 - (B) Mutual Exclusion
 - (C) Regression
 - (D) Progression
 - (E) None of the above

19. If we write a program in a programming language and switch to SQL when we require to use the DB, then the SQL environment in use is known as _____ SQL.
- (A) PL (B) Embedded
(C) Dynamic (D) All of the above
(E) None of the above
20. The _____ algorithm computes the same optimal move as minimax, but achieves much greater efficiency by eliminating subtrees that are provably irrelevant.
- (A) Alpha-beta search (B) DFS
(C) BFS (D) Heuristic
(E) None of the above
21. _____ helps decide in advance which moves will cause a beta cutoff in the successor nodes.
- (A) Morale pruning (B) Futility pruning
(C) Alph-Beta pruning (D) Null move
(E) None of the above
22. The Minimum time delay required between the initiations of two successive memory operations is known as
- (A) Memory cycle time (B) Memory access time
(C) Transmission time (D) Waiting time
(E) None of the above
23. On receiving an interrupt from an I/O device, the CPU
- (A) Halts for a predetermined time
(B) Hands over control of address bus and data bus to the interrupting device
(C) Branches off to the interrupt service routine immediately
(D) Branches off to the interrupt service routine after completion of the current instruction
(E) None of the above

24. De Morgan's first theorem says that a NOR gate is equivalent to a bubbled ... gate(s).
- (A) AND
 - (B) XAND
 - (C) XOR
 - (D) All of the above
 - (E) None of the above
25. A microprocessor has memory locations from 0000 to 3FFF. Each memory location stores 1 byte. How many bytes can the memory store (Express in Kilobytes)?
- (A) 4095, 4K
 - (B) 16384, 16K
 - (C) 32740, 32K
 - (D) 46040, 46K
 - (E) None of the above
26. Part-Whole hierarchy relationship among the objects is called
- (A) Aggregation
 - (B) Inheritance
 - (C) Association
 - (D) All of the above
 - (E) None of the above
27. YaCC builds up ...
- (A) SLR parsing table
 - (B) Canonical LR parsing table
 - (C) LALR parsing table
 - (D) All of the above
 - (E) None of the above
28. The 'k' in LR(k) cannot be
- (A) 0
 - (B) 1
 - (C) 2
 - (D) 3
 - (E) None of the above
29. What are the three techniques that are important for loop optimization?
- (A) Code motion, induction-variable elimination, reduction in strength
 - (B) Code motion, induction, reduction in strength
 - (C) Dead code, constant-folding, reduction in strength
 - (D) All of the above
 - (E) None of the above

30. Consider the grammar shown below and identify its type.

$S \rightarrow C C$

$C \rightarrow c C \mid d$

- (A) LL(1)
- (B) SLR (1) but not LL (1)
- (C) LR (1) but not LALR (1)
- (D) All of the above
- (E) None of the above

31. TP monitors first became popular in the 1970's on

- (A) Mainframes
- (B) Desktops
- (C) Notebooks
- (D) Palm tops
- (E) None of the above

32. The most basic type of middle layer is _____

- (A) DBMS server
- (B) Application server
- (C) Messaging server
- (D) Transaction monitor
- (E) None of the above

33. _____ is not well suited for applications involving distributed objects or object-oriented programming.

- (A) Object request broker
- (B) Message oriented middleware
- (C) RPC
- (D) None of the above
- (E) All of the above

34. _____ is a software that resides in both portions of client/server architecture and typically supports asynchronous calls between client and server applications.

- (A) Object request broker
- (B) Message oriented middleware
- (C) Java
- (D) All of the above
- (E) None of the above

35. Benefits of OOD are
- (A) Less analysis effort
 - (B) Simplified mapping to the problem domain
 - (C) Less complexity in system design
 - (D) All of the above
 - (E) None of the above
36. Which of the following is false with multilevel index?
- (A) Requires less number of I/O operation compared to binary search
 - (B) Requires fewer I/O operations
 - (C) Requires less storage compared to a single large index
 - (D) All of the above
 - (E) None of the above
37. A program reads an array of n characters, each of which is either an open or close paranthesis and outputs true or false based on whether they match or not. For instance, $((..)$ does match , but $(())$ does not. Which data structure is most appropriate for solving the problem?
- (A) AVL tree
 - (B) Stack
 - (C) Queue
 - (D) All of the above
 - (E) None of the above
38. Which of the following statements about HTML help files is/are true?
- (A) They are created using rich text format files
 - (B) They have an .HTM extension
 - (C) They have a .CHM extension
 - (D) All of the above
 - (E) None of the above
39. For R_1 and R_2 to be a lossless decomposition of R , which of the following functional dependency should be present in F^+ ?
- (A) $R_1 \cap R_2 \rightarrow R_1$
 - (B) $R_1 \cup R_2 \rightarrow R_1$
 - (C) $R_1 \cap R_2 \rightarrow R$
 - (D) All of the above
 - (E) None of the above

40. Indices whose search key specifies an order different from the sequential order of the file are called
- (A) Secondary indices (B) Inverted indices
(C) Distributed indices (D) All of the above
(E) None of the above
41. What is the output of the recursive algorithm given below where A is an integer array and $n \geq 1$?
- Rec(A,n)
If $n == 1$, then, return A[0]
Else return Rec(A,n-1)+A[n-1]
- (A) Length of array (B) Value of last element
(C) Value of first element (D) All of the above
(E) None of the above
42. The operation which combines a Cartesian product and selection operation is called
- (A) Division (B) Intersection
(C) Union (D) All of the above
(E) None of the above
43. A dense undirected graph is a graph in which $E =$
- (A) $O(v^2)$ (B) $O(v)$
(C) $O(2^v)$ (D) All of the above
(E) None of the above
44. In a minimum heap with N nodes, the cost of removing the minimum element in the heap is
- (A) $O(N^2)$ (B) $O(\log N)$
(C) $O(N \log N)$ (D) All of the above
(E) None of the above
45. If you had to sort a list of 1000 numbers ranging in value from 0 to 999999, which sorting algorithm would be the most appropriate choice?
- (A) Radix sort (B) Quick sort
(C) Heap Sort (D) All of the above
(E) None of the above

46. What is the recurrence relation that best describes the worst case running time of Merge sort for an array of size n ?

- (A) $T(n) = T(n/2) + 1$ (B) $T(n) = 2T(n/2) + 1$
(C) $T(n) = 2T(n/2) + n$ (D) All of the above
(E) None of the above

47. What is the running time of the following recurrence relation?

$$T(n) = T(1), \quad n=1, \\ T(n/2) + c, \quad n > 1$$

- (A) $O(n \log n)$ (B) $O(\log n)$
(C) $O(n^2)$ (D) All of the above
(E) None of the above

48. The number of different binary trees with n nodes is given by the formula

- (A) $1/(n+1) 2^n C_n$ (B) $1/n 2^n C_n$
(C) $1/(n+1) n C_n$ (D) All of the above
(E) None of the above

49. Arrange the following sorting algorithms in ascending order of their worst case time complexity : Pigeon Hole, Merge sort, Quick sort, Selection sort, Insertion sort.

- (A) 1, 2, 3, 4, 5 (B) 2, 3, 1, 5, 4
(C) 3, 2, 1, 4, 5 (D) All of the above
(E) None of the above

50. What is the output of the following recursive function if $\text{ack}(3,2)$ is called?

```
Ack(int m, int n)
{
    if (m==0), return n+1,
    elseif (m>0 && n==0), return ack(m-1, 1);
    else return (ack(m-1), ack(m,n-1));
}
```

- (A) 13 (B) 9
(C) 29 (D) All of the above
(E) None of the above

51. Which algorithm among the following will always return the correct result?
- (A) Monte Carlo
 - (B) Las Vegas
 - (C) Genetic
 - (D) All of the above
 - (E) None of the above
52. What is the speciality of AVL tree?
- (A) It is a height balanced tree.
 - (B) Lookup, insertion and deletion takes $O(\log n)$ time
 - (C) It is a self balancing binary search tree.
 - (D) All of the above
 - (E) None of the above
53. What is the insertion and lookup time in red-black trees?
- (A) $O(\log n)$, $O(n)$
 - (B) $O(n)$, $O(\log n)$
 - (C) $O(\log n)$, $O(\log n)$
 - (D) All of the above
 - (E) None of the above
54. Triggers can be written for
- (A) Insert, delete, update
 - (B) Create, alter, drop
 - (C) Login, logout
 - (D) All of the above
 - (E) None of the above
55. An Oracle PL/SQL block is always
- (A) Interpreted
 - (B) Compiled
 - (C) Interpreted and then compiled
 - (D) All of the above
 - (E) None of the above
56. System event triggers are always
- (A) Row level
 - (B) Table level
 - (C) Schema level
 - (D) All of the above
 - (E) None of the above

57. Cyclomatic complexity gives a quantitative measure of
- (A) Complexity of the loops in a program
 - (B) Logical complexity of the branches in a program
 - (C) Logical complexity of a program
 - (D) All of the above
 - (E) None of the above
58. The stored subprogram(s) available in Oracle is/are
- (A) Procedures
 - (B) Functions
 - (C) Packages
 - (D) All of the above
 - (E) None of the above
59. If $R=(A,B,C,G,H,I)$ is a relation and $F=(A \rightarrow B, A \rightarrow C, G \rightarrow H)$ is the set of functional dependencies, then AG^+ is given by
- (A) AGHB
 - (B) ABCGHI
 - (C) ABCGH
 - (D) All of the above
 - (E) None of the above
60. Partial dependency in a relation occurs due to the presence of
- (A) Composite keys
 - (B) Foreign keys
 - (C) Candidate keys
 - (D) All of the above
 - (E) None of the above
61. If in a relation $R=(name, age, id, address)$ and $F=(name \rightarrow age; id, age \rightarrow address)$, then as per pseudo transitivity rule,
- (A) Name, id \rightarrow address
 - (B) Name, address \rightarrow id
 - (C) Name, id \rightarrow age
 - (D) All of the above
 - (E) None of the above
62. Which of the following statement is false about hash index?
- (A) Provides direct access to data.
 - (B) Used as a secondary index structure
 - (C) Not suited for growing databases
 - (D) All of the above
 - (E) None of the above

63. The task sets in a spiral model depends on the
- (A) Size of the project
 - (B) Characteristics of the project
 - (C) Criticality of the project
 - (D) All of the above
 - (E) None of the above
64. A relational database which is in 3NF may still have undesirable data redundancy because there may exist
- (A) Non-trivial functional dependencies involving prime attributes on the right side
 - (B) Non-trivial functional dependencies involving prime attributes only on the left side
 - (C) Non-trivial functional dependencies involving attributes other than prime attributes
 - (D) All of the above
 - (E) None of the above
65. If ABC forms a superkey of relation R1 and if AB can uniquely identify a tuple in R1, then it is called
- (A) Primary key
 - (B) Super key
 - (C) Candidate Key
 - (D) All of the above
 - (E) None of the above
66. .Net can be used to develop
- (A) Console applications
 - (B) Web applications
 - (C) Desktop applications
 - (D) All of the above
 - (E) None of the above
67. Hashing technique that allows the hash function to be modified according to the growth or shrinkage of database is called
- (A) Auto hashing
 - (B) Dynamic hashing
 - (C) Variable hashing
 - (D) All of the above
 - (E) None of the above

68. Indices whose search key specifies an order different from the sequential order of the file are called
- (A) Secondary indices
 - (B) Inverted indices
 - (C) Distributed indices
 - (D) All of the above
 - (E) None of the above
69. The State-space search which operates in the backward direction is called
- (A) Mutex
 - (B) Mutual Exclusion
 - (C) Regression
 - (D) Progression
 - (E) None of the above
70. _____ algorithm schedules actions in a greedy fashion.
- (A) Heuristic
 - (B) DFS
 - (C) BFS
 - (D) Minimum slack
 - (E) None of the above
71. _____ detects violations of the preconditions for successful completion of the plan.
- (A) Hierarchical task network
 - (B) Execution monitoring
 - (C) Joint Intention
 - (D) All of the above
 - (E) None of the above
72. Which test is normally used for time critical projects?
- (A) Regression testing
 - (B) Smoke testing
 - (C) Stress testing
 - (D) All of the above
 - (E) None of the above
73. Preferences expressed by utilities are combined with probabilities in the general theory of rational decisions is called
- (A) Probability theory
 - (B) Graph theory
 - (C) Decision theory
 - (D) Utility theory
 - (E) None of the above

74. UDP transmits
- (A) Packets
 - (B) Segments
 - (C) Buffers
 - (D) All of the above
 - (E) None of the above
75. RTCP is the acronym for
- (A) Realtime Transport Control Protocol
 - (B) Realtime Transmission Control Protocol
 - (C) Realtime Transmission Controlled Protocol
 - (D) Random Transport Control Protocol
 - (E) None of the above
76. Port numbers below 1024 are called
- (A) Well known ports
 - (B) Known ports
 - (C) Predefined ports
 - (D) All of the above
 - (E) None of the above
77. DNS is the acronym for
- (A) Domain Name Socket
 - (B) Domain Name Server
 - (C) Domain Name Space
 - (D) Domain Name System
 - (E) None of the above
78. COCOMO II does not consist of
- (A) Application Composition
 - (B) Early Design
 - (C) Post-Architecture model
 - (D) All of the above
 - (E) None of the above
79. Find the odd man
- (A) FTP
 - (B) HTTP
 - (C) Telnet
 - (D) POP
 - (E) None of the above

80. PHP stands for
- (A) Preformed Hypertext Processing
 - (B) Predefined Hypertext Processing
 - (C) Processing High-end Preferences
 - (D) Hypertext Pre-processor
 - (E) None of the above
81. Namespace in an XML document is defined by
- (A) WWW
 - (B) URI
 - (C) W3C
 - (D) All of the above
 - (E) None of the above
82. A plus sign (+) after the element name in the DTD declaration for an XML document denotes the element can have
- (A) Zero or one child
 - (B) One or more children
 - (C) Zero or more children
 - (D) All of the above
 - (E) None of the above
83. The use of DTD and SCHEMA is/ are to validate the
- (A) XML document
 - (B) HTML document
 - (C) PDF document
 - (D) Both (A) & (B)
 - (E) None of the above
84. The general strategy of delaying a choice during search is called a
- (A) Probability theory
 - (B) Utility theory
 - (C) Least commitment
 - (D) Dempster-Shafer theory
 - (E) None of the above
85. RLC instruction is equivalent to
- (A) STC
 - (B) DAD H
 - (C) CMC
 - (D) All of the above
 - (E) None of the above
86. Approaches that project managers can follow in order to manage a risk is
- (A) Proactive
 - (B) Preventive
 - (C) Corrective
 - (D) All the above
 - (E) None of the above

87. The reduced form of the Boolean expression $(A + B)(A + C)$ is
- (A) $AB + AC$
 - (B) $AC + B$
 - (C) $A + BC$
 - (D) All of the above
 - (E) None of the above
88. The m bit parallel adder consists of
- (A) $m+1$ full adders
 - (B) $m-1$ full adders
 - (C) m full adders
 - (D) $2m$ full adders
 - (E) None of the above
89. A flow graph G is reducible if and only if
- (A) We can partition the edges into 2 disjoint groups
 - (B) We can partition the edges into 2 joint groups
 - (C) We can not partition the edges into 2 disjoint groups
 - (D) All of the above
 - (E) None of the above
90. A variable X is called an induction variable of a loop L if every time the variable X changes values,
- (A) It is increased or decreased by same constant
 - (B) It is only increased but not decreased by same constant
 - (C) It is not increased but decreased by same constant
 - (D) All of the above
 - (E) None of the above
91. Dependency Graph is defined as
- (A) The interdependencies among the inherited and synthesized attributes at the nodes in a parse tree can be depicted by a directed graph
 - (B) The interdependencies among the all kind of attributes at different nodes in a parse tree can be depicted by a directed graph
 - (C) The interdependencies among the inherited and synthesized attributes at the nodes in a parse tree can be depicted by a undirected graph
 - (D) All of the above
 - (E) None of the above

92. _____ technology has been used to automatically control and monitor commit and/or rollback activities for transactions in a distributed database system.
- (A) Two phase commit
 - (B) Three phase commit
 - (C) One phase commit
 - (D) All of the above
 - (E) None of the above
93. _____ is a client/server infrastructure that increases the interoperability, portability and flexibility of an application by allowing the application to be distributed over multiple heterogeneous platform.
- (A) Java
 - (B) RMI
 - (C) RPC
 - (D) OOD
 - (E) None of the above
94. Which of the following statement is false?
- (A) Every BCNF decomposition is lossless
 - (B) Every BCNF is in 3NF
 - (C) Every BCNF is dependency preserving
 - (D) All of the above
 - (E) None of the above
95. _____ allows the remote component to be accessed without knowledge of the network address.
- (A) Java
 - (B) RMI
 - (C) RPC
 - (D) OOD
 - (E) None of the above
96. _____ is a software that resides in both portions of client/server architecture and typically supports asynchronous calls between client and server applications.
- (A) Object request broker
 - (B) Message oriented middleware
 - (C) Java
 - (D) All of the above
 - (E) None of the above

97. Which of the following is /are mobile Operating System(s)?
- (A) Symbian
 - (B) Solr
 - (C) MobOs
 - (D) All of the above
 - (E) None of the above
98. Which one of the following is true for a CPU having a single interrupt request line and a single interrupt grant line?
- (A) Neither vectored interrupt nor multiple interrupting devices are possible
 - (B) Vectored interrupts are not possible but multiple interrupting devices are possible
 - (C) Vectored interrupts and multiple interrupting devices are both possible
 - (D) Vectored interrupt is possible but multiple interrupting devices are not possible
 - (E) None of the above
99. In which way(s) a macro processor for assembly language can be implemented
- (A) Independent two-pass processor
 - (B) Independent one-pass processor
 - (C) Processor incorporated into pass 1 of a standard two-pass assembler
 - (D) All of the above
 - (E) None of the above
100. The advantage of a command processor running only built-in command is
- (A) Flexibility to the users in running lists of commands by simply collecting them in named batch command files
 - (B) The command set being common across different hardware configurations
 - (C) Users can create system programs and run them as commands
 - (D) The processing is much faster than would otherwise be the case when user defined commands are used.
 - (E) None of the above
-